New Mexico State Implementation Plan

Regional Haze
Section 309(g)

New Mexico Environment Department
Air Quality Bureau
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(revised March 31, 2011)
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development of reasonable progress goals: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming.

Opportunities for consultation on development of reasonable progress goals provided through the WRAP Implementation Work Group have been documented in calls listed on the Implementation Work Group section of the WRAP website at: http://www.wrapair.org/forums/iwg/meetings.html.

Pursuant to 40 CFR Section 51.308(d)(iv), the State of New Mexico also gave opportunity for neighboring states to comment on the State of New Mexico's reasonable progress goals for each Class I area located within the state. Opportunity for comment from other states was offered through a public hearing on the 2003 Section 309 SIP, held in accordance with 40 CFR Section 51.102. The following states in the WRAP region were notified of the SIP public hearing: Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Nevada, and Hawaii. The following states in the neighboring Central States Regional Planning Organization (CENRAP) were notified of the SIP public hearing: Iowa, Kansas, Minnesota, Missouri, Nebraska, Oklahoma, and Texas.

Pursuant to 40 CFR 51.308(d)(3)(i), the State of New Mexico has participated in regional planning and coordination with other states in developing emission management strategies if emissions from within the state contribute to visibility impairment in a mandatory Class I Federal area outside the state, or if emissions from another state, regional planning organization, country, tribal area, or offshore location contribute to visibility impairment in any Class I Federal area within the state. This participation was through the WRAP. A more detailed description of the goals, objectives, management, and decision-making structure of the WRAP has been included in Chapter 5. The following WRAP forums have provided consultation opportunities between states on emission management strategies:

Air Pollution Prevention Forum
Dust Emissions Forum
Economic Analysis Forum
Emissions Forum
Fire Emissions Joint Forum
Mobile Sources Forum
Sources In and Near Class I Areas Forum
Stationary Sources Joint Forum
Technical Analysis Forum

Opportunities for consultation on emission strategies provided through the WRAP have been documented in calls and meetings on the WRAP website at: http://www.wrapair.org/cal/calendar.php.

A description of the selected emission management strategies for the State of New Mexico is described in Chapter 12 of this Plan. The State of New Mexico views the development of coordinated emission management strategies to be a long-term commitment, and therefore, the State of New Mexico agrees to continue to participate in the WRAP or an alternative Regional Planning Organization in developing coordinated emission management strategies for SIP revisions in 2013 and 2018.

Through the WRAP consultation process the State of New Mexico has reviewed and analyzed the contributions from other states that reasonably may cause or contribute to visibility impairment in New Mexico's Class I areas. New Mexico acknowledges that the long-term strategies adopted by Colorado, Arizona, Colorado, and Texas in their SIPs and approved by EPA will include emission reductions from a variety of sources that will reduce visibility impairment in New Mexico's Class I areas.

2.3 Reasonable Progress Summary

Pursuant to 40 CFR 51.308(h)(2), the State of New Mexico has determined this first State Implementation Plan is adequate to ensure reasonable progress for the first planning period of the regional haze long-term planning effort which extends out to the year 2064. While emissions from sources outside of the State of New Mexico have resulted in a slower rate of improvement in visibility than the rate that would be needed to attain natural conditions by 2064, most of these emissions are beyond the control of any state in the regional planning area of the WRAP. [~~Two Class I areas in New Mexico show degradation: Gila Wilderness for both the 20 percent best and worst days, and~~] The modeling for Carlsbad Caverns National Park shows degradation for the 20 percent [~~worst~~] best days. The emission sources include: emissions from outside the WRAP domain; emissions from Mexico; emissions from wildfires and windblown dust; and emissions from CENRAP and the Eastern U.S. In addition, future area source emissions based on strong population growth are unlikely to occur at rates predicted when the modeling for this SIP was performed. A report prepared for WRAP by Eastern Research Group (ERG) used the EPA model EGAS to estimate growth in area sources. This model over predicts area source growth by using a simple multiplier and does not take into account additional regulatory requirements, both federal and state, in the analysis. As shown in Section 11.3.3, emissions from Mexico are projected to increase and result in degradation at Carlsbad Caverns for the best days in 2018. In contrast to modeled predictions, Figure 6-1 shows that actual visibility measurements from 2005 through 2009 show improvement in the best days at Carlsbad Caverns National Park.

A more detailed description and quantification of these uncontrolled emissions is included in the Source Apportionment and Regional Haze Modeling chapter of this SIP. Additional strategies to address emissions beyond the control of any state in the WRAP under the jurisdiction of EPA are discussed in the Long-Term Strategy chapter of this SIP.

2.4 Tribal Consultation

Although tribal consultation is not required under the Regional Haze Rule, NMED views this as an important part of the consultation process, and actively pursued this during the development of the Regional Haze Plan.

2.5 Public and Stakeholder Outreach

New Mexico participated in numerous stakeholder meetings during the WRAP process and continues to meet with stakeholders. Additional stakeholder meetings will be held during the public comment period of this SIP proposal.

Table 6-3: 2064 Natural Conditions Goal for 20% Worst and Best Days

Mandatory Federal Class I Area	IMPROVE Monitor	2064 Natural Conditions for 20% Best and Worst Visibility Days (dv)	
		20% Worst	20% Best
Bandelier Wilderness	BAND1	6.26	1.29
Bosque del Apache NWR	BOAP1	6.73	2.16
Carlsbad Caverns NP	GUMO1	6.65	0.99
Gila Wilderness	GICL1	6.66	0.52
Pecos Wilderness, Wheeler Peak Wilderness	WHPE1	6.08	-0.57
Salt Creek Wilderness	SACR1	6.81	2.12
White Mountain Wilderness	WHIT1	6.8	0.66

6.5 Uniform Progress

For the 20% worst days, uniform progress for each Class I area is the calculation of a URP goal per year to achieve natural conditions in 60 years [40 CFR 51.308(d)(1)(i)(B)]. In this SIP submittal, the first benchmark is the 2018 deciview level based on the uniform rate of progress (URP) applied to the first fourteen years of the program. This is also shown in Table 6-3 in the column titled "2018 URP Goal".

For the 20% worst days, the uniform rate of progress (URP) in deciviews per year (i.e., slope of the glide path) is determined by the following equation:

URP = [Baseline Condition – Natural Condition]/60 years

Multiplying the URP by the number of years in the first planning period calculates the uniform progress needed by 2018 in order to be on the glidepath towards achieving the 2064 natural conditions goal.

2018 UPG = [URP] x [14 years]

The first planning period spans 14 years, which includes the four years between the end of the baseline period and the SIP submittal plus the standard 10 year planning period for the subsequent SIP revisions.

More detailed information on the 20% worst visibility days along with the glide slope associated with each Class I area can be found in Chapter 9. The calculations are consistent with EPA's *Guidance for Setting Reasonable Progress Goals Under the Regional Haze Rule* (June 1, 2007).

For the 20% best visibility days at each Class I area, the State must ensure no degradation in visibility for the least impaired days over the same period. WRAP modeling predicts visibility degradation at Carlsbad Caverns National Park for the 20% best days. However, Figure 6-1 shows that visibility is actually improving on the best days from 2005 through 2009. The over-prediction for area sources and the growth of emissions from Mexico is likely responsible for this modeled projection of worsening visibility on the best days.

During the WRAP process Western states and EPA agreed that the tremendous amount of data collected, analyzed, and maintained by the WRAP would be impracticable and nearly infeasible to include in individual technical support documents for individual states. For purposes of administrative efficiency, WRAP data and analyses that the member states are utilizing to develop their Regional Haze SIPs are available through the WRAP and the TSS website.

8.4 New Mexico Emissions Data

CFR 40.51.308(d)(4)(v) requires a statewide emission inventory of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I area. The pollutants inventoried by the WRAP that New Mexico will use include sulfur dioxide (SO_2), volatile organic compounds (VOC), primary organic aerosol (POA), elemental carbon (EC), fine particulate matter (Soil-$PM_{2.5}$), coarse particulate matter ($PM_{2.5}$ to PM_{10}), and ammonia (NH_3). An inventory was developed for the baseline year 2002 and projections of future emissions have been made for 2018. New Mexico will provide updates to WRAP on this inventory on a periodic basis. A summary of the inventory results follows.

It should be noted that area emissions growth was based on use of an EPA model that was subsequently withdrawn by EPA. Overall growth in emissions was estimated at 4.5 percent.

Emission inventories are developed for all of the species or pollutants known to directly or indirectly impact visibility. Inventories are used with air quality models to predict concentrations of pollutants at future dates. WRAP developed emission inventories with input and data provided by Western states and stakeholders. A description of the development and content of the emission inventories can be found on the WRAP TSS website at the following link: http://vista.cira.colostate.edu/TSS/Results/Emissions.aspx

Dispersion modeling predicts daily atmospheric concentrations of pollutants for the baseline year and these modeled results are compared to monitored data taken from the IMPROVE network. A second inventory is created to predict emission in 2018 based on expected controls, growth, or other factors. Additional inventories are created for future years to simulate the impact of different control strategies. The process for inventorying sources is similar for all species of interest. The number and types of sources is identified by various methods. For example, major stationary sources report actual annual emission rates to the EPA national emission database. New Mexico collects annual emission data from both major sources. This information is used as input into the emissions inventory. In other cases, such as mobile sources, an EPA mobile source emissions model is used to develop emission projections. Population, employment, and household data are used in other parts of the emission modeling to characterize emissions from area sources such as home heating. Thus, for each source type, emissions are calculated based on an emission rate and the amount of time the source is operating. Emission rates can be based on actual measurements from the source, or EPA emission factors based on data from tests of similar types of emission sources. In essence all sources go through the same process. The number of sources is identified, emission rates are determined by measurements of those types of sources and the time of operation is determined. By multiplying the emission rate times the hours of operation in a day, a daily emission rate can be calculated.

The following tables represent New Mexico emissions posted on the TSS. The tables include a column for total New Mexico emissions, and for New Mexico emissions excluding Bernalillo County. Bernalillo County has submitted a SIP for Regional Haze separate from this New Mexico SIP that addresses Bernalillo County strategies for regional haze. "Plan02d" means baseline emissions for the years 2000-2004. The Plan02d emissions inventory was developed Summer 2007, is based on Plan02a-b-c predecessors, and was used for final baseline regional haze analysis and modeling. Information came from WRAP region States and Tribes with gap-filling based on EPA data. "Prp18b" means the projected emissions for 2018. Version B of the 2018 Preliminary Reasonable Progress (PRP18b) emission inventory provides data for assessment of reasonable progress toward visibility goals by WRAP region states and EPA offices, building from PRP18a. This is the final estimate of 2018 regional emissions for the baseline regional haze implementation plans. The PRP18b inventory includes BART determinations as reported by states and EPA offices, projection of future fossil-fuel electrical generation plants, revised control strategy rulemakings, and updated permit limits for point and area sources in the WRAP region, as of Spring 2009.

Table 8-1: New Mexico SO_2 Emission Inventory – 2002 & 2018

Source Category	Plan02d (tpy)		Prp18b (tpy)		Net Change (%)	
	NM total	NM excl. Bern. Co.	NM total	NM excl. Bern. Co.	NM	NM excl. Bern. Co.
Point	37,918	36,736	31,270	29,640	-18	-19
Anthro Fire	94	94	72	72	-24	-24
Natural Fire	2,729	2,727	2,729	2,727	0	0
Biogenic	0	0	0	0	0	0
Area	5,433	2,383	16,285	3,983	200	67
Wrap Area O&G	250	250	12	12	-95	-95
On-Road Mobile	2,066	1,643	334	252	-84	-85
Off-Road Mobile	3,846	3,540	313	228	-92	-94
Road Dust	4	4	6	5	34	34
Fugitive Dust	6	5	7	6	18	21
WB Dust	0	0	0	0	0	0
Total	52,347	47,381	51,028	36,924	-3	-22

Table 8-2: New Mexico NO_X Emission Inventory – 2002 & 2018

Source Category	Plan02d (tpy)		Prp18b (tpy)		Net Change (%)	
	NM total	NM excl. Bern. Co.	NM total	NM excl. Bern. Co.	NM	NM excl. Bern. Co.
Point	100,398	98,115	73,417	69,996	-27	-29
Anthro Fire	396	395	263	263	-34	-34
Natural Fire	8,613	8,608	8,613	8,607	0	0
Biogenic	42,139	41,950	42,139	41,950	0	0
Area	25,140	13,023	33,931	16,781	35	29
Wrap Area O&G	56,210	56,196	74,648	74,648	33	33
On-Road Mobile	67,835	51,623	19,746	15,360	-71	-70
Off-Road Mobile	45,311	42,277	28,471	26,606	-37	-37
Road Dust	1	1	2	1	34	33
Fugitive Dust	7	5	7	6	2	2
WB Dust	0	0	0	0	0	0
Total	346,050	312,193	281,236	254,218	-19	-19

Table 8-3: New Mexico VOC Emission Inventory – 2002 & 2018

Source Category	Plan02d (tpy)		Prp18b (tpy)		Net Change (%)	
	NM total	NM excl. Bern. Co.	NM total	NM excl. Bern. Co.	NM	NM excl. Bern. Co.
Point	17,574	17,277	26,308	25,871	50	50
Anthro Fire	608	607	388	387	-36	-36
Natural Fire	18,846	18,834	18,846	18,833	0	0
Biogenic	1,016,487	1,007,457	1,016,487	1,007,457	0	0
Area	49,010	37,106	70,566	53,163	44	43
Wrap Area O&G	224,268	224,156	267,846	267,846	19	19
On-Road Mobile	38,768	28,897	15,554	11,679	-60	-60
Off-Road Mobile	13,850	10,462	8,942	6,765	-35	-35
Road Dust	0	0	0	0	0	0
Fugitive Dust	0	0	0	0	0	0
WB Dust	0	0	0	0	0	0
Total	1,379,410	1,344,795	1,424,936	1,392,002	3	4

Table 8-4: New Mexico Primary Organic Aerosol (POA) Emission Inventory – 2002 & 2018

Source Category	Plan02d (tpy)		Prp18b (tpy)		Net Change (%)	
	NM total	NM excl. Bern. Co.	NM total	NM excl. Bern. Co.	NM	NM excl. Bern. Co.
Point	978	968	243	240	-75	-75
Anthro Fire	682	681	442	441	-35	-35
Natural Fire	16,272	16,257	16,271	16,256	0	0
Biogenic	0	0	0	0	0	0
Area	2,529	2,023	2,848	2,279	13	13
Wrap Area O&G	0	0	0	0	0	0
On-Road Mobile	653	497	656	508	0	2
Off-Road Mobile	563	471	358	281	-36	-40
Road Dust	114	102	153	136	34	34
Fugitive Dust	360	268	366	275	2	2
WB Dust	0	0	0	0	0	0
Total	22,151	21,268	21,338	20,417	-4	-4

Table 8-5: New Mexico Elemental Carbon (EC) Emission Inventory – 2002 & 2018

Source Category	Plan02d (tpy)		Prp18b (tpy)		Net Change (%)	
	NM total	NM excl. Bern. Co.	NM total	NM excl. Bern. Co.	NM	NM excl. Bern. Co.
Point	13	12	13	13	4	4
Anthro Fire	123	123	85	85	-31	-31
Natural Fire	3,293	3,291	3,293	3,291	0	0
Biogenic	0	0	0	0	0	0
Area	301	244	374	287	24	17
Wrap Area O&G	0	0	0	0	0	0
On-Road Mobile	756	586	205	160	-73	-73
Off-Road Mobile	1,526	1,355	743	662	-51	-51
Road Dust	9	8	13	11	34	34
Fugitive Dust	24	18	25	19	2	2
WB Dust	0	0	0	0	0	0
Total	6,046	5,638	4,750	4,526	-21	-20

Table 8-6: New Mexico Soil (PM Fine/$PM_{2.5}$) Emission Inventory – 2002 & 2018

Source Category	Plan02d (tpy)		Prp18b (tpy)		Net Change (%)	
	NM total	NM excl. Bern. Co.	NM total	NM excl. Bern. Co.	NM	NM excl. Bern. Co.
Point	1,180	1,160	1,148	1,126	-3	-3
Anthro Fire	87	87	44	44	-49	-49
Natural Fire	1,223	1,220	1,223	1,220	0	0
Biogenic	0	0	0	0	0	0
Area	2,821	2,318	3,644	2,973	29	28
Wrap Area O&G	0	0	0	0	0	0
On-Road Mobile	0	0	0	0	0	0
Off-Road Mobile	0	0	0	0	0	0
Road Dust	1,305	1,192	1,751	1,591	34	33
Fugitive Dust	6,751	5,158	7,026	5,446	4	6
WB Dust	16,399	16,305	16,399	16,305	0	0
Total	29,765	27,440	31,235	28,705	5	5

Table 8-7: New Mexico Coarse Mass (PM Coarse) Emission Inventory – 2002 & 2018

Source Category	Plan02d (tpy) NM total	Plan02d (tpy) NM excl. Bern. Co.	Prp18b (tpy) NM total	Prp18b (tpy) NM excl. Bern. Co.	Net Change (%) NM	Net Change (%) NM excl. Bern. Co.
Point	2,286	1,953	2,142	1,731	-6	-11
Anthro Fire	105	105	63	63	-41	-41
Natural Fire	5,400	5,398	5,400	5,398	0	0
Biogenic	0	0	0	0	0	0
Area	695	534	1,231	723	77	36
Wrap Area O&G	0	0	0	0	0	0
On-Road Mobile	403	306	464	357	15	17
Off-Road Mobile	0	0	0	0	0	0
Road Dust	11,074	10,206	14,857	13,618	34	33
Fugitive Dust	51,533	36,306	56,533	41,429	10	14
WB Dust	147,589	146,747	147,589	146,747	0	0
Total	219,086	201,556	228,279	210,066	4	4

Table 8-8: New Mexico Ammonia (NH_3) Emission Inventory – 2002 & 2018

Source Category	Plan02d (tpy) NM total	Plan02d (tpy) NM excl. Bern. Co.	Prp18b (tpy) NM total	Prp18b (tpy) NM excl. Bern. Co.	Net Change (%) NM	Net Change (%) NM excl. Bern. Co.
Point	75	51	118	66	58	30
Anthro Fire	75	75	42	42	-44	-44
Natural Fire	1,875	1,873	1,875	1,873	0	0
Biogenic	0	0	0	0	0	0
Area	29,959	29,112	30,233	29,343	1	1
Wrap Area O&G	0	0	0	0	0	0
On-Road Mobile	2,132	1,605	2,877	2,139	35	33
Off-Road Mobile	26	23	36	32	38	38
Road Dust	0	0	0	0	0	0
Fugitive Dust	0	0	0	0	0	0
WB Dust	0	0	0	0	0	0
Total	34,141	32,740	35,181	33,495	3	2

CHAPTER 9: VISIBILITY MODELING AND SOURCE APPORTIONMENT

9.1 Modeling Overview

Appendix B is a WRAP document that includes a detailed description of the air quality modeling performed for the WRAP region. Additional information on visibility modeling is available on both WRAP's website at http://vista.cira.colostate.edu/TSS/Results/Modeling.aspx and at the Regional Modeling Center's website at http://pah.cert.ucr.edu/rmc/index.shtml.

CMAQ

The Regional Modeling Center (RMC) Air Quality Modeling Group is responsible for regional haze modeling for the WRAP. The RMC is located at the University of California – Riverside in the College of Engineering Center for Environmental Research and Technology.

The RMC modeling analysis is based on a model domain comprising the continental U.S. using the Community Multi-Scale Air Quality (CMAQ) model. The EPA developed the CMAQ modeling system in the late 1990s. CMAQ was designed as a "one atmosphere" modeling system to encompass modeling of multiple pollutants and issues, including ozone, PM, visibility, and air toxics. This is in contrast to many earlier air quality models that focused on single-pollutant issues (e.g., ozone modeling by the Urban Airshed Model). CMAQ is an Eulerian Model; it is a grid-based model is which the frame of reference is a fixed, three-dimensional (3-D) grid with uniformly sized horizontal grid cells and variable vertical layer thicknesses. The key science processes included in CMAQ are emissions, advection and dispersion, photochemical transformation, aerosol. Thermodynamics and phase transfer, aqueous chemistry, and wet and dry deposition of trace species.

The RMC developed air quality modeling inputs including annual meteorology and emissions inventories for a 2002 actual emissions base case (Base02), a planning case to represent the 2000 – 2004 baseline period (Plan02), and a 2018 base case (Base 18) of projected emissions using factors known at the end of 2005. All emission inventories were developed during the Sparse Matrix Operator Kernel Emission (SMOKE) modeling system. These inventories were revised during the development process. The development of these emission scenarios is documented under the emissions inventory sections of the TSS.

The 2018 visibility projections (PRP18b) were developed using the Plan02d and Base 18b CMAQ 36-km modeling results. Projections were made using relative response factors (RRFs), which are defined as the ratio of the future-year modeling results to the current year modeling results. The calculated RRFs are applied to the baseline observed visibility conditions to project future year observed visibility.

The CMAQ modeling for PRP18b included emissions after reductions from the following programs and regulations:

- Smoke Management Program accounted for using Emissions Reduction Techniques (ERTs) applied to the 2000-2004 average fire emissions.
- New permits and State/EPA consent agreements since 2002 reviewed with each State through 2007.
- Ozone and PM_{10} SIPs in place within the WRAP region
- State Oil and Gas emission control programs.
- Mobile sources:
  - Heavy Duty Diesel (2007) Engine Standard
  - Tier 2 Tailpipe

- Large Spark Ignition and Recreational Vehicle rule
- Nonroad Diesel Rule
- Combustion Turbine and Industrial Boiler/Process Heater/RICE MACT
- Known BART control in the WRAP region.
- Presumptive SO_2 BART for EGUs in the WRAP region.

Generally, emission inputs were prepared by individual States and Tribes for point, area, and most dust emissions categories. The following WRAP Forums were relied upon to summarize this data and provide it to the RMC.

- Point Source emissions were obtained from a project commissioned by the Stationary Source Joint Forum and the Emission Forum.
- Area Source emissions were obtained from a project commissioned by the Stationary Source Joint Forum and the Emission Forum.
- Mobile Source emissions were from a project commissioned by the Emissions Forum.
- Fire (natural and anthropogenic) emissions were from projects commissioned by the Fire Emissions Joint Forum
- Ammonia, Dust, & Biogenic emissions were from projects commissioned by the Dust Emissions Joint Forum and the Modeling Forum.
- Emissions from Pacific Offshore shipping were from a project conducted by the RMC.
- Other emissions from North America were from projects commissioned by the Emission Forum and the Modeling Forum. [~~The Mexico emission are from 1999 and were held constant for 2018.~~] The Mexico emissions are from the Phase III 2018 inventory produced by ERG, Inc. The Phase III 2018 Mexico inventory replaced the 1999 Mexican inventories that we used in simulation PRP18a. Canada emissions are from 2000 and were held constant for 2018.
- Boundary conditions reaching North America from the rest of the world were from a project commissioned by the VISTAS Regional Planning Organization, on behalf of the five regional planning organizations working on regional haze.

The 2018 Preliminary Reasonable Progress, version B (PRP18b), makes a second revision to the 2018 emissions inventory projections for point and area sources in the WRAP region to provide a more current assessment of the reasonable progress toward visibility goals by the WRAP. The PRP18b addresses changes that occurred since January 2007 in the following areas.

- BART determinations (or expected BART control levels where BART had not been finalized);
- Projections of "future" fossil-fuel plants needed to achieve 2018 federal electrical generation demand forecasts;
- New rulemaking, permit limits, and consent decrees; and
- Other outstanding issues that were identified by the federal, state, or local agencies within the WRAP domain as needing to be corrected or updated.

PSAT

The RMC also developed the Particulate Matter Source Apportionment Technology (PSAT) algorithm in the Comprehensive Air Quality Model with extensions (CAMx) model to assess source attribution. The PSAT analysis is used to attribute particle species, particularly sulfate and nitrate from a specific location within the WRAP modeling domain. The PSAT algorithm applies nitrate-sulfate-ammonia chemistry to a system of tracers or "tags" to track the chemical transformations, transport and removal of emissions.

Each state or region (i.e., Mexico, Canada) is assigned a unique number that is used to tag the emissions from each 36-kilometer grid cell within the WRAP modeling domain. Due to time and computational limitations, only point, mobile, area and fire emissions were tagged.

impairment of visibility in any [Class I] area." Alternatively, States may choose to presume that all BART-eligible sources within the State meet this applicability test, but provide sources with the ability to demonstrate on a case-by-case basis that this is not the case.

10.3.1 New Mexico Process

When considering the options provided by EPA, NMED determined that the third option is the most consistent with the American Corn Growers case, as this option provides a rebuttable method for the evaluation of the visibility impact from a single source. If the air dispersion modeling analysis shows that a facility causes or contributes to Regional Haze, then it is required to address BART. A State is also provided with flexibility under this option, as it may exempt from BART any source that is not reasonably anticipated to cause or contribute to visibility degradation in a Class I area.

In May 2006, the New Mexico Environment Department Air Quality Bureau (Department) conducted an internal review of sources potentially subject to the BART rule.

Section II of the Guidelines prescribes how to identify BART-eligible sources. States are required to identify those sources that satisfy the following criteria: sources that fall within the 26 listed source categories as listed in the CAA, sources that were "in existence" on August 7, 1977 but were not "in operation" before August 7, 1962, and sources that have a current potential to emit that is greater than 250 tons per year of any single visibility impairing pollutant. New Mexico identified 11 sources as BART-eligible sources as part of this review. The 11 BART eligible sources identified in New Mexico are Giant Refining, Ciniza Refinery (now Western Refining Southwest, Gallup Refinery); Public Service Company of New Mexico, San Juan Generating Station Boilers 1 through 4; Giant Refining San Juan Refinery (now Western Refining Southwest, Bloomfield Refinery) Unit #1 fluid catalytic cracking unit electrostatic precipitator; DEFS Artesia Gas Plant (now DCP Midstream Artesia Gas Plant) sulfur recovery unit; Amoco Empire Abo (now Frontier Field Services Empire Abo Gas Plant) sulfur recovery unit; Marathon Indian Basin Gas Plant (now Oxy USA WTP Indian Basin Gas Plant) sulfur recovery unit; DEFS Linam Ranch Gas Plant (now DCP Midstream Linam Ranch Gas Plant) sulfur recovery unit, Dynegy Saunders (now Versado Gas Processors Saunders Gas Plant) sulfur recovery unit; Southwestern Public Service Cunningham Station; Southwestern Public Service Maddox Station; El Paso Rio Grande Generating Station.

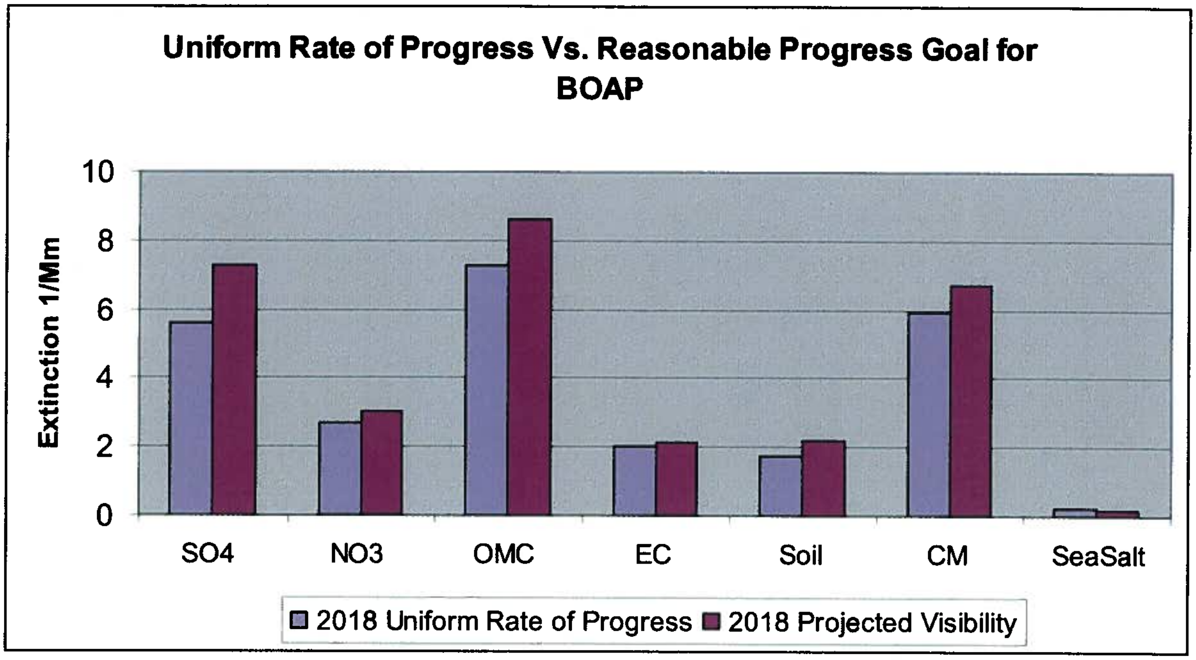
The Guidelines then prescribe to the states how to identify those sources that are subject to BART. At this point, states are directed to either (1) make BART determinations for all BART-eligible sources, or (2) to consider exempting some of the sources from BART because they may not reasonably be anticipated to cause or contribute to any visibility impairment in a Class I area. New Mexico opted to perform an initial screening model on the BART-eligible sources to determine whether a source did cause or contribute to any visibility impairment. The Guidelines direct States that if the analysis shows that an individual source or group of sources is not reasonably anticipated to cause or contribute to any visibility impairment in a Class I area, then the States do not need to make a BART determination for that source or group of sources.

The Western Regional Air Partnership (WRAP) performed the initial BART modeling for the state of New Mexico. The procedures used are outlined in the WRAP Regional Modeling Center (RMC) BART Modeling Protocol that is available at:

http://pah.cert.ucr.edu/aqm/308/bart/WRAP_RMC_BART_Protocol_Aug15_2006.pdf

The basic assumptions in the WRAP BART CALMET/CALPUFF modeling used for New Mexico are as follows:

Figure 11-2: Uniform Rate of Progress Comparison to Reasonable Progress Goals for Bosque del Apache



11.3.3 Carlsbad Caverns National Park

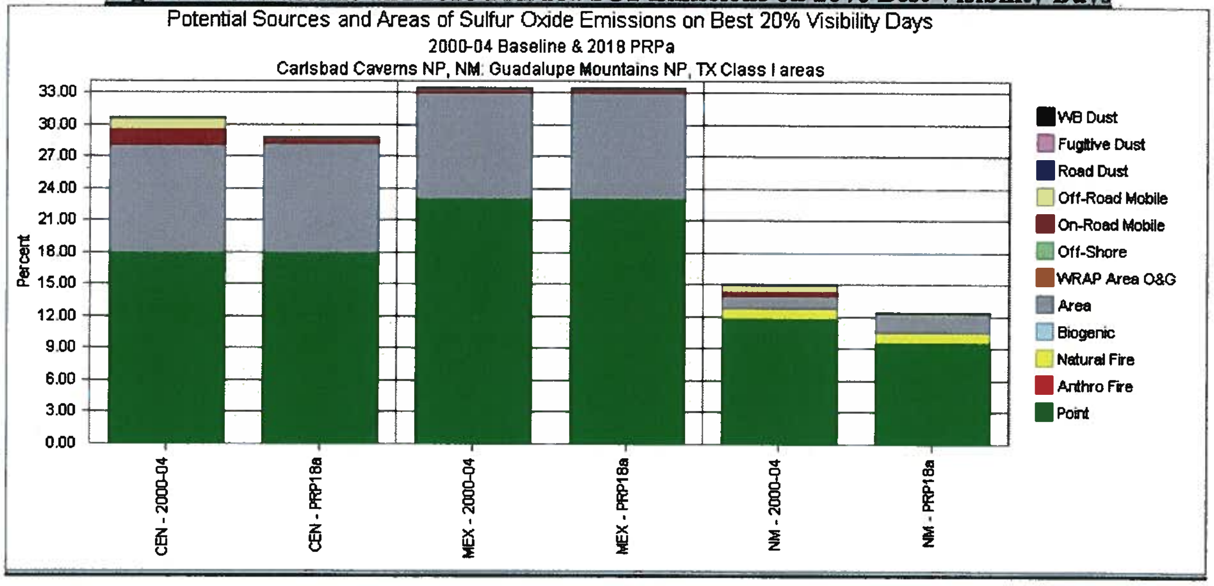
The monitor for Carlsbad Caverns National Park is the closest one to Mexico in the IMPROVE network for New Mexico's Class I areas. New Mexico has historically received pollution from international sources affecting air quality as well as visibility in the state. GUMO is showing some improvement in visibility from baseline to 2018 projected for the worst days, but is hindered by international and interstate contributions. As Section 9.4.3 shows, international and interstate emissions are a significant contributor to SO_4, CM, and OMC in New Mexico.

Although the model predictions are that nitrates, organic carbon and fine soil will degrade visibility by 2018, 2005 through 2009 observations suggest that all three of these visibility impairing pollutants are decreasing at Carlsbad Caverns as show in Figure 9-4.

In the PRP18b modeling run, emissions were updated to project 2018 Mexico emissions which were held constant in the PRP18a modeling run. This resulted in a showing of degradation to Carlsbad Caverns National Park for the 20 percent best days, as demonstrated in the following figures.

Figures 11-3 and 11-4 show the differences from the growth of the Mexican emissions for 2018 for the three areas with the most impact to Carlsbad Caverns National Park: CENRAP, Mexico and New Mexico. Figure 11-3 is based on modeling results with Mexican emissions held constant.

Figure 11-3: Baseline and 2018 PRP18a SO2 Emissions on 20% Best Visibility Days



As shown in Figure 11-4, over 90 percent of the sulfur oxide emissions in 2018 that impact Carlsbad Caverns National Park are projected to come from Mexico.

Figure 11-4: Baseline and 2018 PRP18b SO2 Emissions on 20% Best Visibility Days

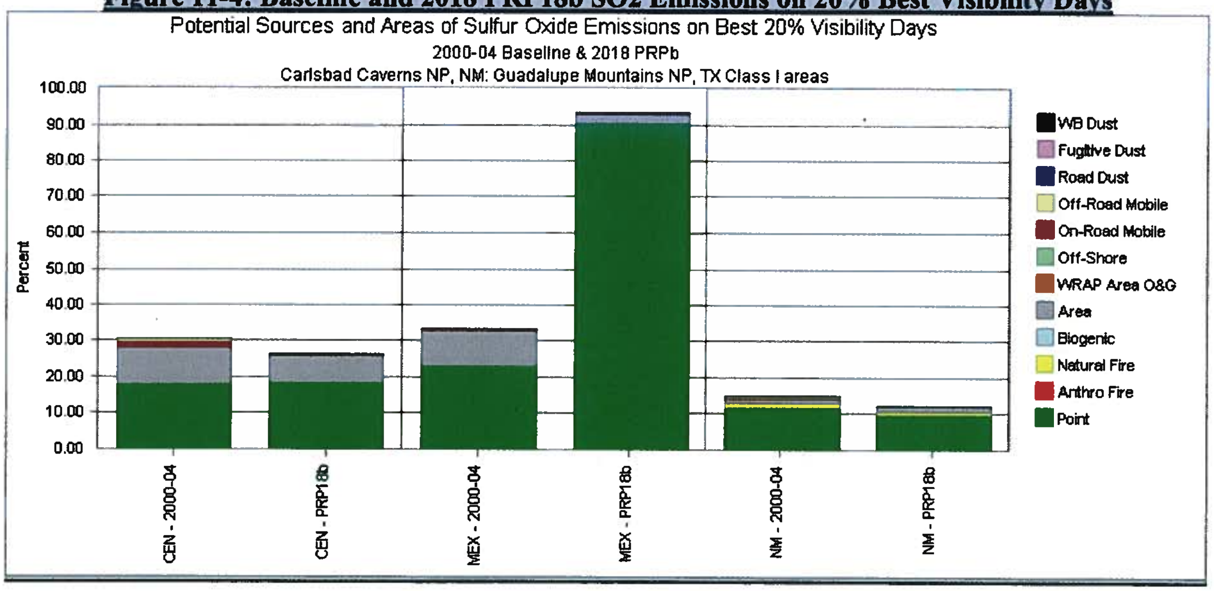


Figure 11-5 shows that visibility conditions for the best days at Carlsbad Caverns National Park were projected to improve slightly when emissions from Mexico are held constant.

Figure 11-5: Projected 2018 PRP18a Visibility Conditions on 20% Best Visibility Days

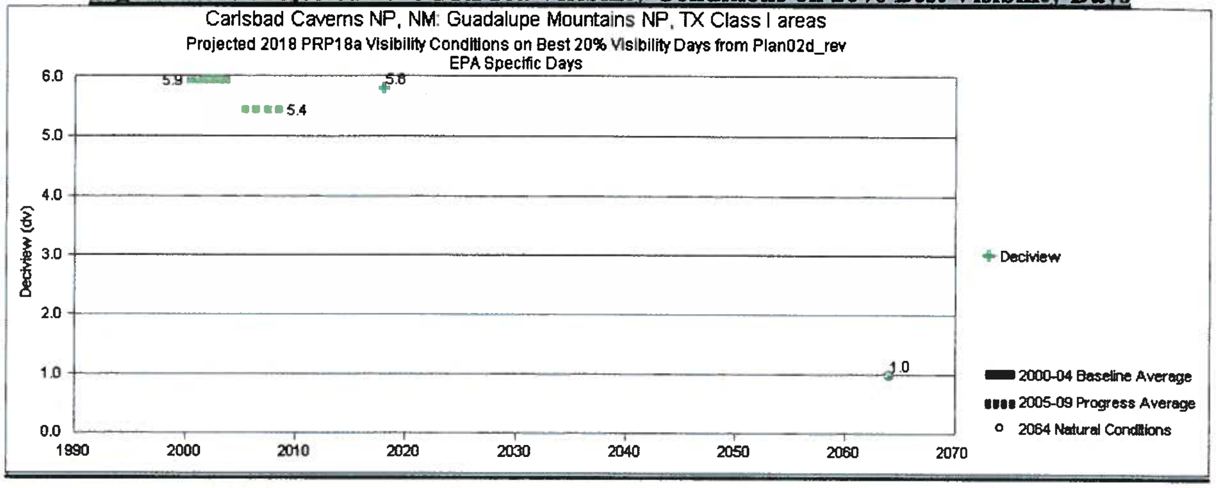
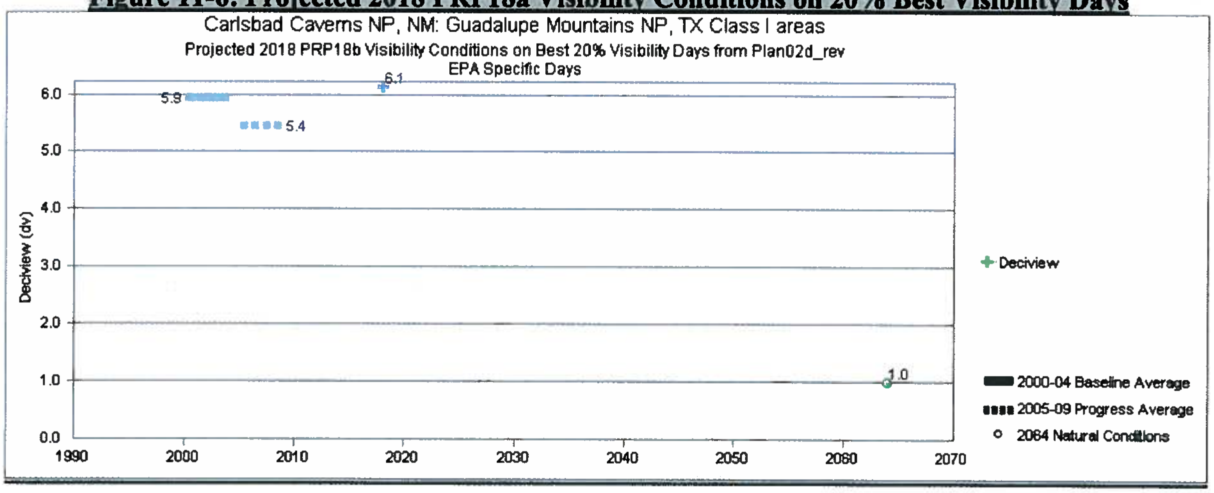


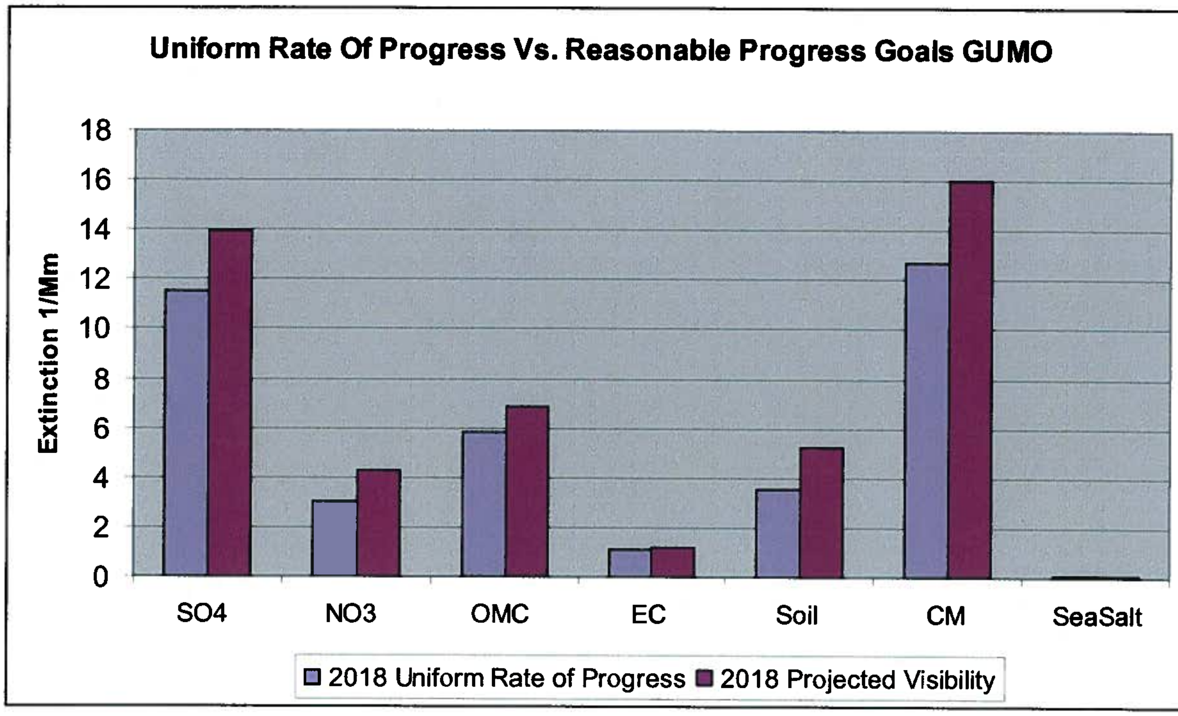
Figure 11-6 shows that visibility on the best days at Carlsbad Caverns are predicted to degrade slightly from baseline when emissions from Mexico are grown for the 2018 inventory.

Figure 11-6: Projected 2018 PRP18a Visibility Conditions on 20% Best Visibility Days



Although New Mexico continues to work with Mexico and Texas on air quality issues within the southern region of the state, New Mexico has no control or jurisdiction over emissions coming from Mexico or Texas. Future work is needed on the federal level to determine the extent of emission contributions from Mexico on bordering states for regional haze and the National Ambient Air Quality Standards. Due to the lack of information available on emissions from Mexico and the jurisdiction to control a majority of the emissions affecting GUMO, New Mexico believes the improvement projected for 2018 is reasonable.

Figure 11-7: Uniform Rate of Progress Comparison to Reasonable Progress Goals for Carlsbad Caverns



11.3.4 Gila Wilderness

The Gila Wilderness is [~~the only Class I area in New Mexico that showed an increase in visibility impairment from baseline to 2018 projected rather than a decrease~~] located in the southwest area of New Mexico. As Figure 11-8 below shows, organic matter is the primary source of visibility impairment within GILA, but the area is also affected by SO_4 and EC emissions. Contributions of OMC and EC, as shown in Section 9.4.4, to visibility impairment in GILA are primarily from wildfires both locally and regionally. Controlled burns conducted under New Mexico's Smoke Management Program are often used as a forest management tool in this area, but the emissions from wildfires affecting visibility in GILA are more than ten times greater than the emissions from controlled burns. Wildfires are a common occurrence throughout the state and regardless of where they occur, New Mexico has little to no control over the emissions that are generated from them.

Modeled projections in Table 9-5 show increased impairment from [~~sulfate, organic carbon, elemental carbon and~~] fine soil at Gila Wilderness. Figure 9-6 illustrates the actual decrease in visibility impairment in deciviews from 2005-2009 based on monitoring data. In addition, impairment from [~~organic carbon, elemental carbon, and~~] fine soil has decreased. Sulfate impairment increased in this time period. Decreases from sulfate due to BART application in Arizona should result in decreased impairment at Gila. This should result in decreased SO_4 impact compared to what is shown in Figure 11-8 for 2018. [~~In addition, there appears to be a data error in wildfire worst days in Plan 02d that resulted in increased wildfire emissions instead of wildfire remaining constant over the planning period. This would account for the increases in OMC and EC shown in Figure 11-8.~~]

Gila Wilderness is affected by SO_2 emissions from New Mexico as well as interstate and international source, as shown in Section 9.4.4. Participation in the SO_2 Backstop Trading Program will assist in

CHAPTER 12: LONG-TERM STRATEGY (LTS)

12.1 Overview

The Regional Haze Rule requires states to submit a 10-15 year long-term strategy (LTS) to address regional haze visibility impairment in each Class I area in the state, and for each Class I area outside the state which may be affected by emissions from the state. The LTS must include enforceable measures necessary to achieve reasonable progress goals, and identify all anthropogenic sources of visibility impairment considered by the state in developing the long-term strategy. Where the state contributes to Class I visibility impairment in other states it must consult with those states and develop coordinated emission management strategies, and demonstrate it has included all measures necessary to obtain its share of the emission reductions. If the state has participated in a regional planning process, the state must include measures needed to achieve its obligations agreed upon through that process.

Summary of all Anthropogenic Sources of Visibility Impairment Considered in Developing the Long-Term Strategy

Section 51.308(d)(3)(iv) of the Regional Haze Rule requires the identification of "all anthropogenic sources of visibility impairment considered by the State when developing its long-term strategy." Chapter 8 of this Plan describes New Mexico's statewide emissions, including projections of emissions reductions from anthropogenic sources from 2002 to 2018. Section 9.3 of this Plan provides source apportionment results, including projected reductions from anthropogenic sources during the same period. Chapter 9 addresses anthropogenic sources from all potential sources in the world. Together, these chapters show the major anthropogenic sources affecting regional haze in New Mexico and in the West. Chapter 11 further describes the major anthropogenic source categories evaluated through the four-factor analysis.

Summary of Interstate Transport and Contribution

Sections 51.308(d)(3)(i) and (ii) of the Regional Haze Rule requires that the Long-Term Strategy address the contribution of interstate transport of haze pollutants between states. Chapter 8 of this Plan illustrated New Mexico's statewide emissions, while Chapter 9 identified interstate transport of pollutants from larger source categories based on source apportionment results.

12.2 Other States' Class I Areas Affected by New Mexico Emissions

New Mexico used baseline period visibility data from the IMPROVE monitors along with the WRAP baseline modeling results to estimate New Mexico's emissions impact on neighboring states' Class I areas (see Figure 12-1 through Figure 12-12) and their individual Class I Areas (see Tables 12-2 through Table 12-14). New Mexico focused on anthropogenic emissions transported to other states, primarily sulfates and nitrates.

The charts and tables below show the contribution of particle mass calculated from the modeled concentrations of nitrates and sulfates for the baseline years. The charts and tables illustrate the probable share of New Mexico's emissions contributing to the pollutant species in surrounding states.

12.2.1 Nitrate Contributions from New Mexico on Surrounding States' Class I Areas

New Mexico's NOx emissions contribute up to 24% percent of the nitrate concentrations at some neighboring states and up to 60% at individual Class I areas on the worst 20% days according to modeling. As shown in the table below, however, nitrate contributes only up to 19 percent of the visibility impairment in neighboring states. By 2018, NOx emissions from New Mexico are projected by the WRAP to decrease by 57,975 tons, which will help reduce New Mexico's impact to out of state Class I areas. [~~Actual decreases are expected to be higher due to additional NOx reductions at the San Juan Generating Station under EPA's BART determination.~~]

Table 12-1: Nitrate Contribution to Haze in Baseline Years for Worst 20% Days

State	2000-2004 Average Annual Nitrate Share of Particle Light Extinction (measured values)	2000-2004 New Mexico's Average Annual Share of Nitrate Concentration (based on modeling)
Arizona	13.5%	2.7%
Colorado	10.0%	24.7%
Nevada	19.1%	0.1%
Utah	15.9%	6.0%
Texas	6.0%	11.2%
Wyoming	9.9%	0.3%

Figure 12-1: Nitrate Contributions from New Mexico on Arizona Class I Areas

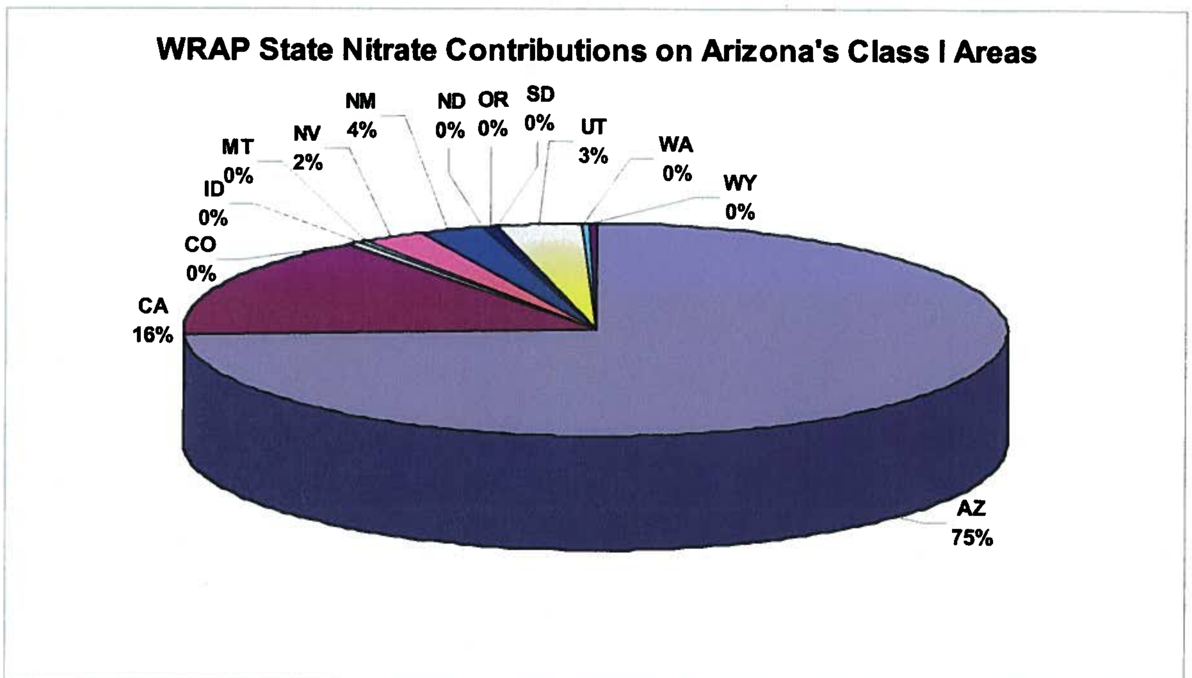


Table 12-2: New Mexico's Nitrate Contribution to Class I Areas in Arizona

Arizona Class I Area Monitoring Sites	New Mexico's Nitrate Contribution in Baseline Years for Worst 20% Days (based on modeling)
Mount Baldy Wilderness (BALD1)	15%
Petrified Forest National Park (PEFO1)	21%
Chiricahua National Monument (CHIR1)	12%
Sierra Ancha Wilderness (SIAN1)	1%
Tonto National Monument (TONT1)	4%
Queen Valley (QUVA1)	0%
Saguaro National Monument (SAGU1)	3%
Saguaro National Monument (West) (SAWE1)	3%
Ike's Backbone (IKBA1)	4%
Phoenix (PHOE1)	2%
Sycamore Canyon Wilderness (SYCA1)	5%
Hillside (HILL1)	0%
Grand Canyon National Park (GRCA2)	1%

Figure 12-2: Nitrate Contributions from New Mexico on Colorado Class I Areas

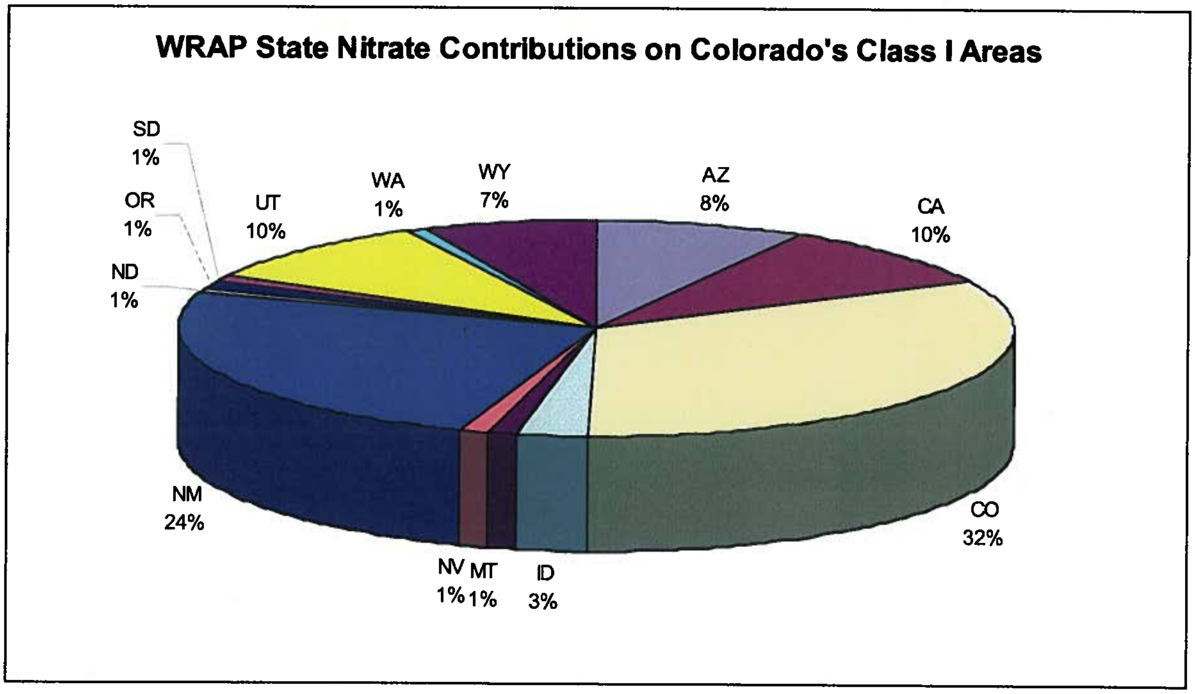


Table 12-3: New Mexico's Nitrate Contribution to Class I Areas in Colorado

Colorado Class I Area Monitoring Sites	New Mexico's Nitrate Contribution in Baseline Years for Worst 20% Days (based on modeling)
Mesa Verde National Monument (MEVE1)	60%
Weminuche Wilderness (WEMI1)	39%
Great Sand Dunes National Monument (GRSA1)	36%
White River National Forest (WHRI1)	11%
Rocky Mountain National Park (ROMO1)	4%
Mount Zirkel Wilderness (MOZI1)	2%

Figure 12-3: Nitrate Contributions from New Mexico on Nevada Class I Areas

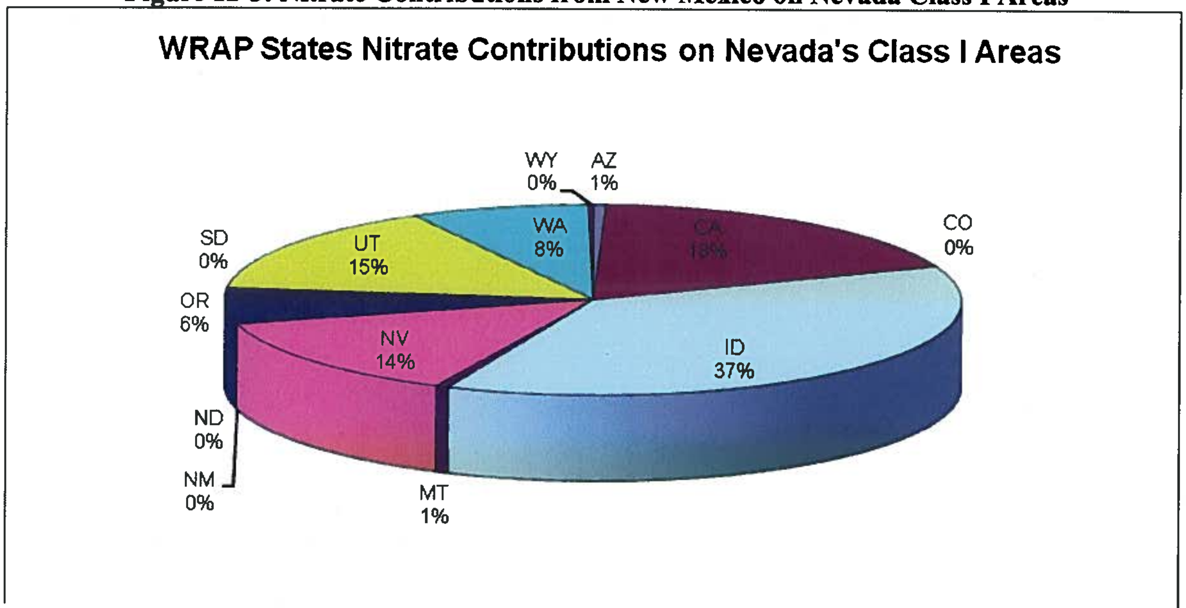


Table 12-4: New Mexico's Nitrate Contribution to Class I Areas in Nevada

Nevada Class I Area Monitoring Sites	New Mexico's Nitrate Contribution in Baseline Years for Worst 20% Days (based on modeling)
Jarbidge Wilderness (JARB1)	0%

Figure 12-4: Nitrate Contributions from New Mexico on Utah Class I Areas

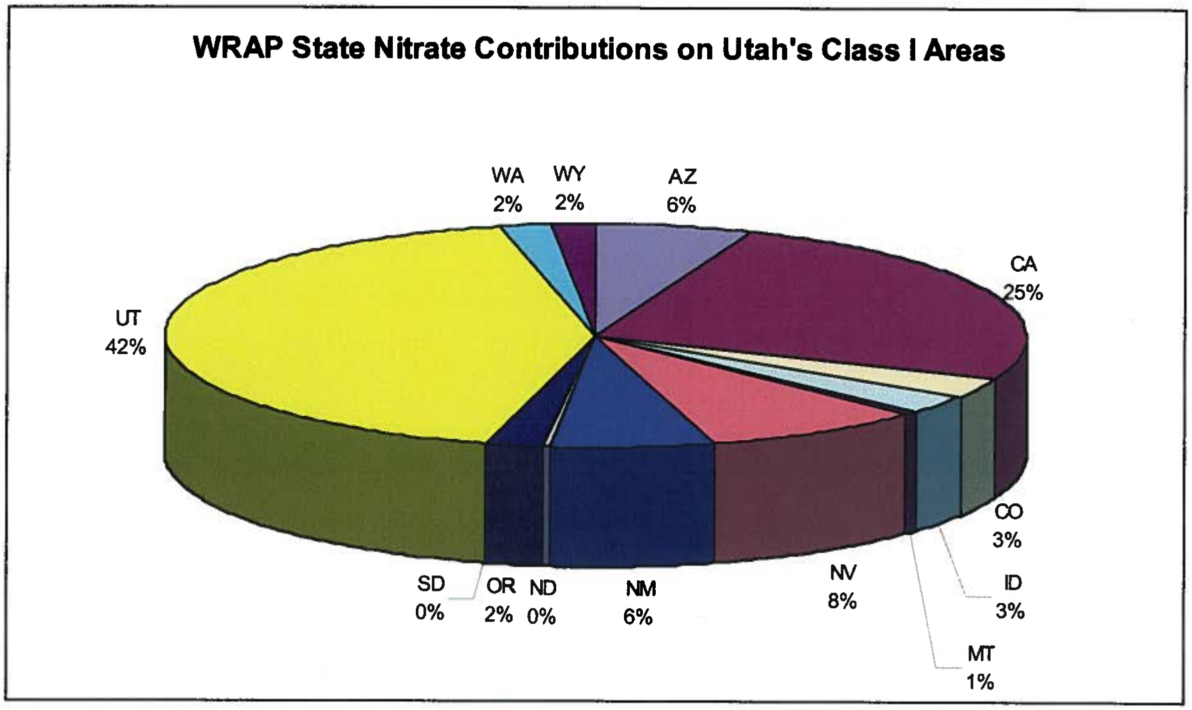


Table 12-5: New Mexico's Nitrate Contribution to Class I Areas in Utah

Utah Class I Area Monitoring Sites	**New Mexico's Nitrate Contribution in Baseline Years for Worst 20% Days (based on modeling)**
Capitol Reef National Park (CAPI1)	2%
Canyonlands National Park (CANY1)	2%
Bryce Canyon National Park (BRCA1)	2%
Zion National Park (ZION1)	3%

Figure 12-5: Nitrate Contributions from New Mexico on Texas Class I Areas

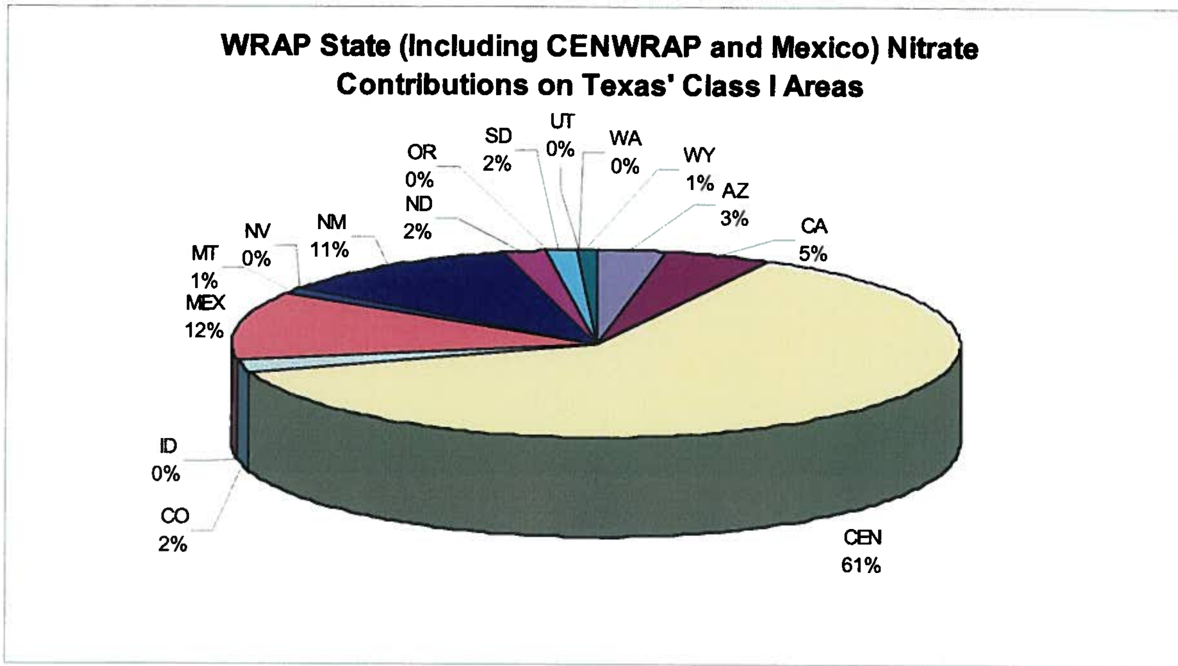


Table 12-6: New Mexico's Nitrate Contribution to Class I Areas in Texas

Texas Class I Area Monitoring Sites	New Mexico's Nitrate Contribution in Baseline Years for Worst 20% Days (based on modeling)
Big Bend National Park (BIBE1)	6%
Guadalupe Mountains National Park (GUMO1)	15%

Figure 12-6: Nitrate Contributions from New Mexico on Wyoming Class I Areas

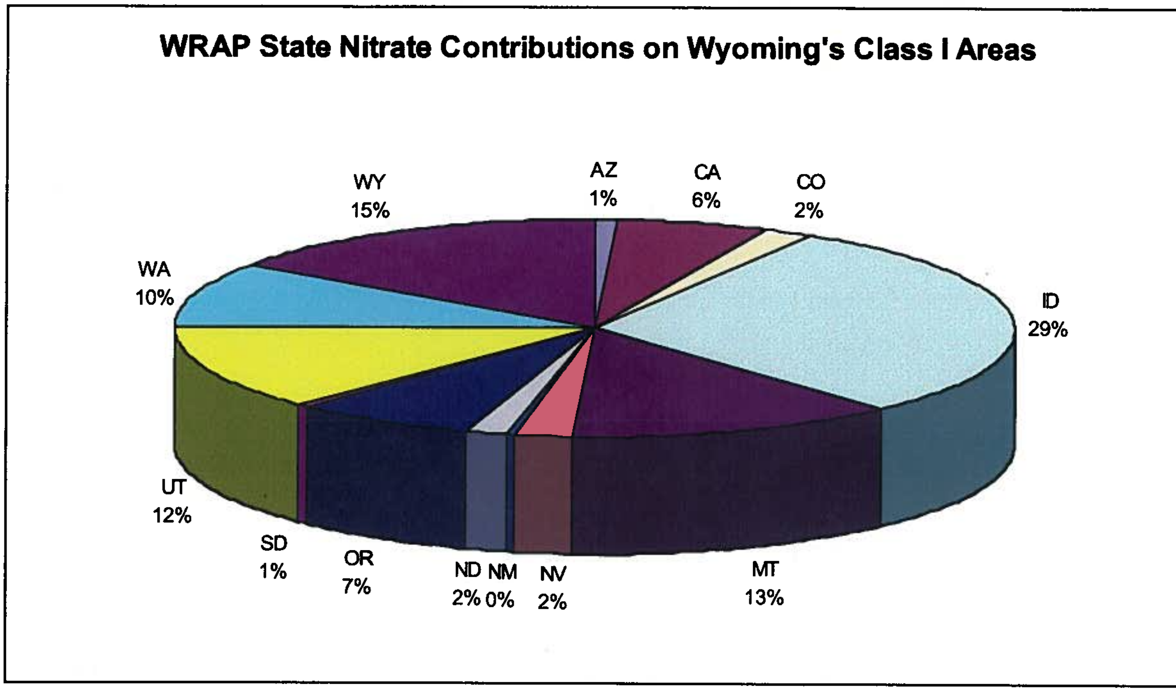


Table 12-7: New Mexico's Nitrate Contribution to Class I Areas in Wyoming

Wyoming Class I Area Monitoring Sites	**New Mexico's Nitrate Contribution in Baseline Years for Worst 20% Days (based on modeling)**
Brooklyn Lake (BRLA1)	3%
Bridger Wilderness Area (BRID1)	0%
Yellowstone National Park (YELL2)	0%
North Absaroka Wilderness (NOAB1)	0%

12.2.2 Sulfate Contributions from New Mexico on Surrounding State's Class I Areas

According to modeling, New Mexico sulfate emissions contribute up to 16.9 percent of the sulfate concentrations at some neighboring states on the worst 20% days. As shown in Table 12-3 below, sulfate contributes up to 44 percent of the visibility impairment at the nearest Class I areas in neighboring states. By 2018, SO_2 emissions from New Mexico are projected by the WRAP to decrease by 10,457 tons, which will help reduce New Mexico's impact on out of state Class I areas.

Table 12-3: Sulfate Contribution to Haze in Baseline Years for Worst 20% Days

State	2000-2004 Average Annual Sulfate Share of Particle Light Extinction (measured values)	2000-2004 New Mexico's Average Annual Share of Sulfate Concentration (based on modeling)
Arizona	18.9%	6.7%
Colorado	21.7%	16.9%
Nevada	17.1%	1.7%
Utah	23.3%	6.9%
Texas	44.0%	1.9%
Wyoming	23.3%	2.5%

Figure 12-7: Sulfate Contributions from New Mexico on Arizona Class I Areas

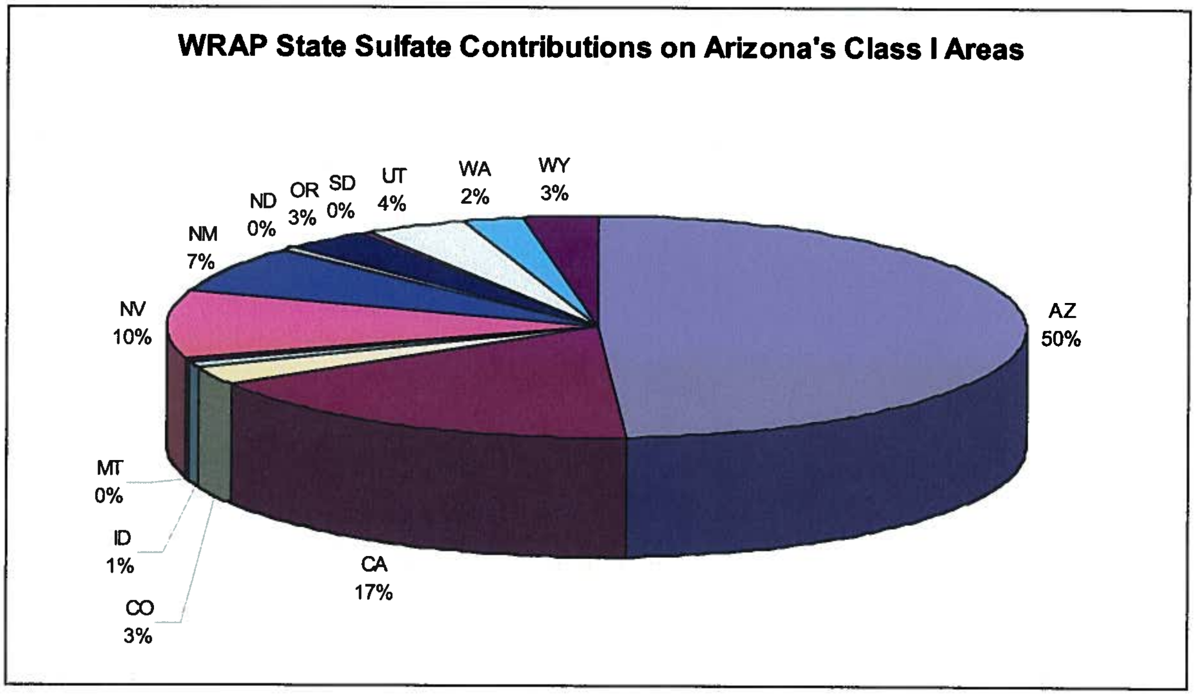


Table 12-9: New Mexico's Sulfate Contribution to Class I Areas in Arizona

Arizona Class I Area Monitoring Sites	New Mexico's Sulfate Contribution in Baseline Years for Worst 20% Days (based on modeling)
Mount Baldy Wilderness (BALD1)	8%
Petrified Forest National Park (PEFO1)	6%
Chiricahua National Monument (CHIR1)	11%
Sierra Ancha Wilderness (SIAN1)	7%
Tonto National Monument (TONT1)	5%
Queen Valley (QUVA1)	7%
Saguaro National Monument (SAGU1)	7%
Saguaro National Monument (West) (SAWE1)	8%
Ike's Backbone (IKBA1)	7%
Phoenix (PHOE1)	5%
Sycamore Canyon Wilderness (SYCA1)	6%
Hillside (HILL1)	5%
Grand Canyon National Park (GRCA2)	5%

Figure 12-8: Sulfate Contributions from New Mexico on Colorado Class I Areas

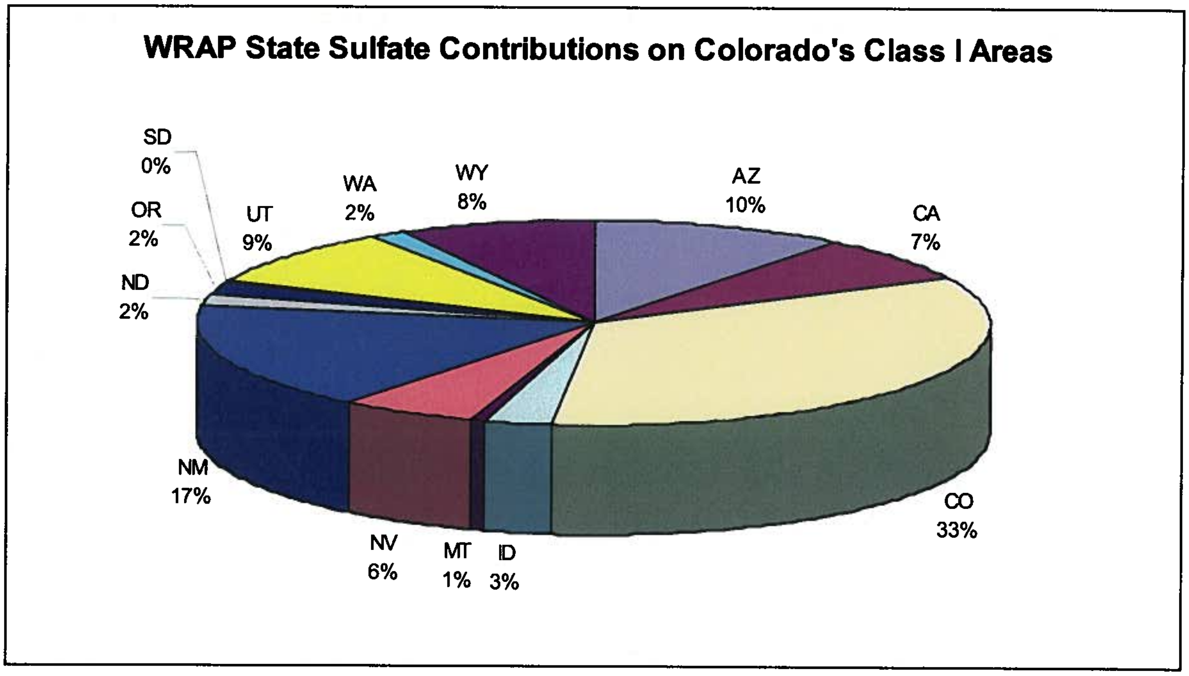


Table 12-10: New Mexico's Sulfate Contribution to Class I Areas in Colorado

Colorado Class I Area Monitoring Sites	New Mexico's Sulfate Contribution in Baseline Years for Worst 20% Days (based on modeling)
Mesa Verde National Monument (MEVE1)	43%
Weminuche Wilderness (WEMI1)	30%
Great Sand Dunes National Monument (GRSA1)	17%
White River National Forest (WHRI1)	16%
Rocky Mountain National Park (ROMO1)	4%
Mount Zirkel Wilderness (MOZI1)	4%

Figure 12-9: Sulfate Contributions from New Mexico on Nevada Class I Areas

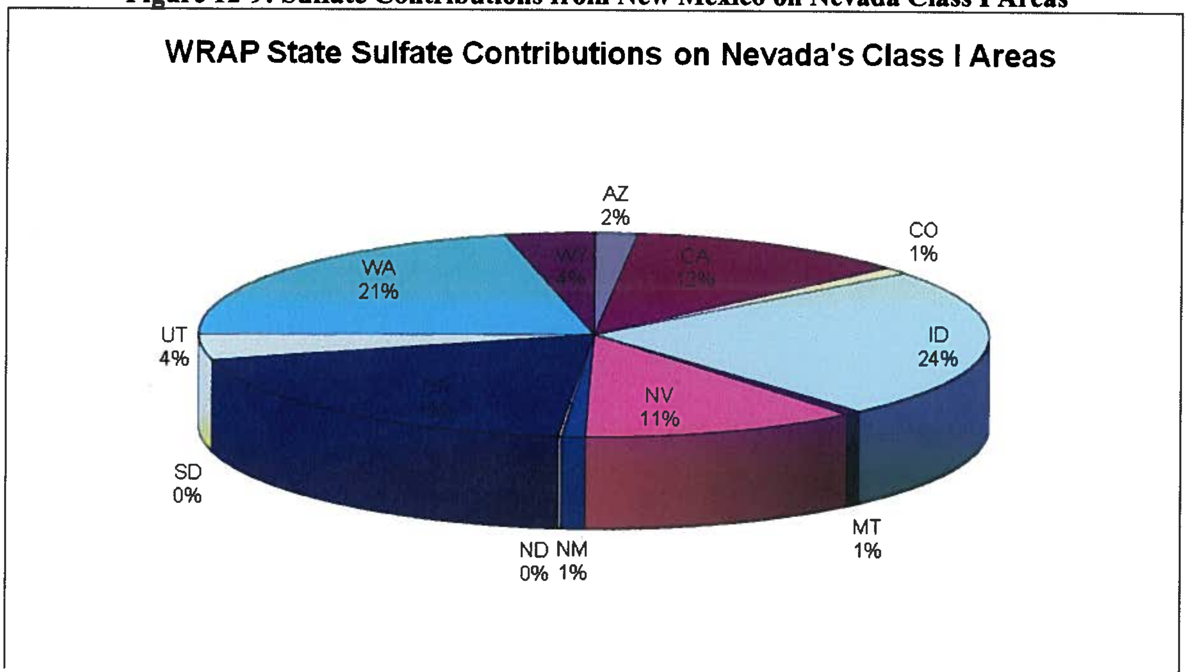


Table 12-11: New Mexico's Sulfate Contribution to Class I Areas in Nevada

Nevada Class I Area Monitoring Sites	New Mexico's Sulfate Contribution in Baseline Years for Worst 20% Days (based on modeling)
Jarbidge Wilderness (JARB1)	1%

Figure 12-10: Sulfate Contributions from New Mexico on Utah Class I Areas

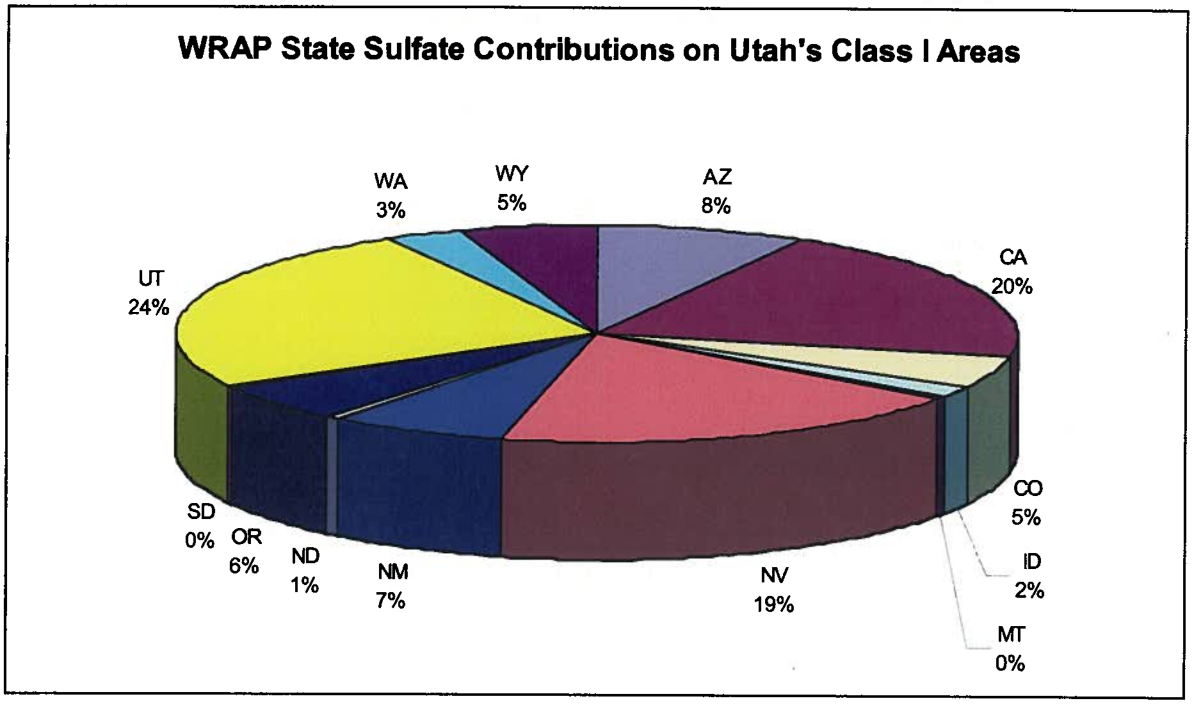


Table 12-12: New Mexico's Sulfate Contribution to Class I Areas in Utah

Utah Class I Area Monitoring Sites	New Mexico's Sulfate Contribution in Baseline Years for Worst 20% Days (based on modeling)
Capitol Reef National Park (CAPI1)	4%
Canyonlands National Park (CANY1)	14%
Bryce Canyon National Park (BRCA1)	4%
Zion National Park (ZION1)	4%

Figure 12-11: Sulfate Contributions from New Mexico on Texas Class I Areas

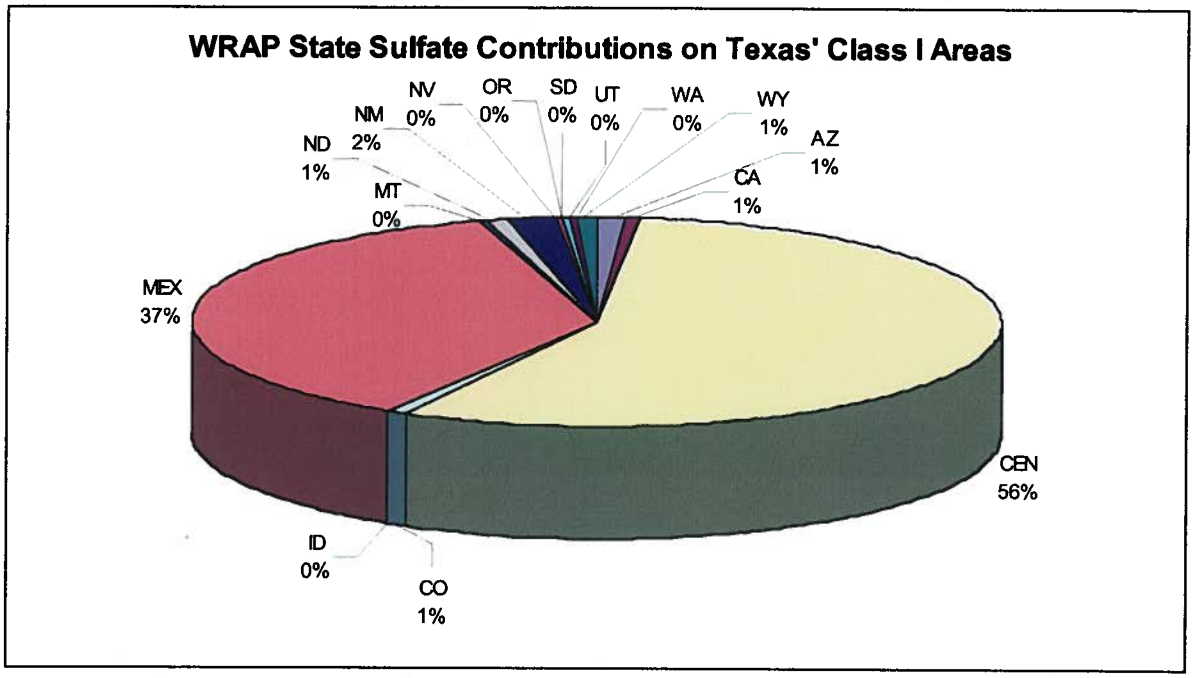


Table 12-13: New Mexico's Sulfate Contribution to Class I Areas in Texas

Texas Class I Area Monitoring Sites	New Mexico's Sulfate Contribution in Baseline Years for Worst 20% Days (based on modeling)
Big Bend National Park (BIBE1)	1%
Guadalupe Mountains National Park (GUMO1)	15%

Figure 12-12: Sulfate Contributions from New Mexico on Wyoming Class I Areas

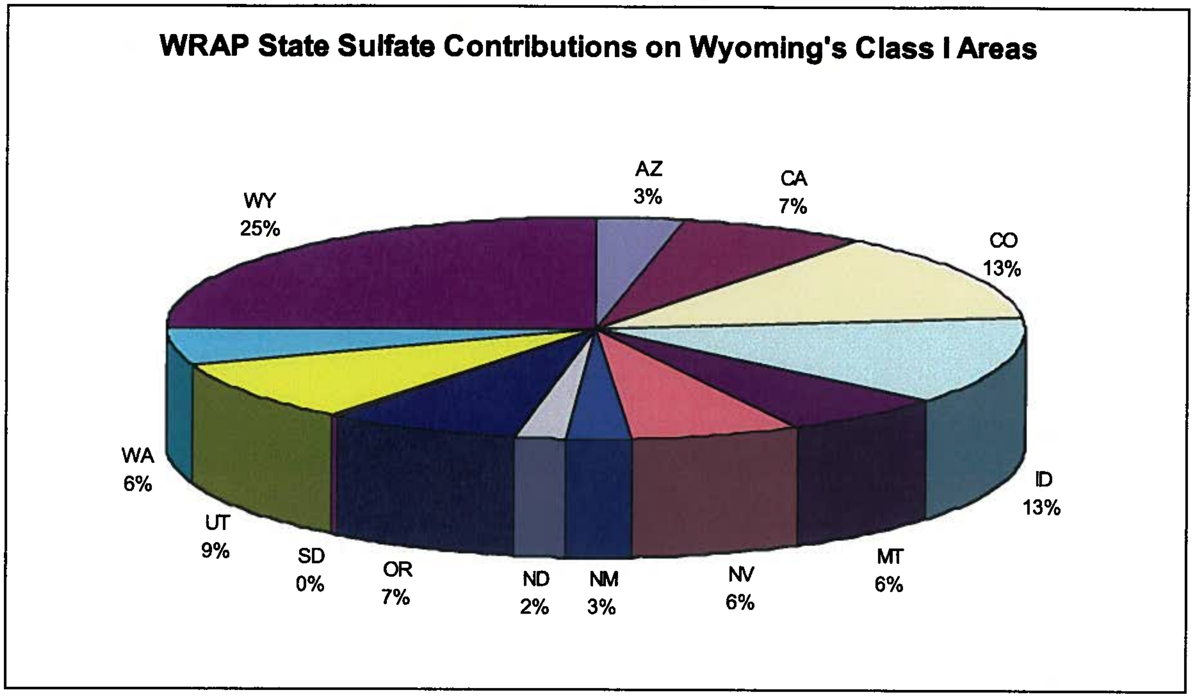


Table 12-14: New Mexico's Sulfate Contribution to Class I Areas in Wyoming

Wyoming Class I Area Monitoring Sites	New Mexico's Sulfate Contribution in Baseline Years for Worst 20% Days (based on modeling)
Brooklyn Lake (BRLA1)	4%
Bridger Wilderness (BRID1)	2%
Yellowstone National Park (YELL2)	2%
North Absaroka Wilderness (NOAB1)	1%

12.3 New Mexico Class I Areas Affected by Other States, Nations and Areas of the World

The contribution of WRAP, CENRAP, Canada, Eastern U.S., Mexico, Pacific Offshore, and areas Outside of Domain to New Mexico Class I areas were examined to determine where significant emissions of nitrates and sulfates might be coming from. The results are shown below in Table 12-4 through Table 12-7. This review focused on nitrates and sulfates since those emissions tend to indicate anthropogenic sources. Data for this impact analysis comes from the PSAT runs performed by the WRAP and documented in the TSS.

12.3.1 Nitrate Emissions

For nitrates on the worst 20% days in the baseline years, the most significant impacts on New Mexico Class I areas came from sources within WRAP, CENRAP and outside the modeling domain. With respect to emissions within the WRAP region, the sources within New Mexico, Arizona, California, and Colorado had the most significant impact on New Mexico Class I areas. New Mexico has worked with Arizona, California and Colorado through the WRAP process and believes all three states are working to

Chapter 9 of this Plan shows the specific results of the CMAQ modeling which was used to make all projections of visibility. Those results show anthropogenic emissions sources generally declining across the West through 2018. However, natural sources such as wildfires and dust and international sources in Mexico appear to offset improvements in visibility from controls on manmade sources in the U.S. In spite of the large number of growing uncontrollable sources in the WRAP region, however, New Mexico does see a net visibility improvement at the New Mexico's Class I areas through 2018. The net effect of all of the reductions in the WRAP region, known at the time of the most recent model run is demonstrated in the WRAP Class I Summary Tables shown below for each of the Class I areas in New Mexico.

12.10 Effects of the Long Term Strategies on Other States' Class I Areas

The strategies utilized in New Mexico for emission reductions for visibility improvement at New Mexico's Class I areas will also benefit Class I areas outside of the state that are currently affected by emission sources within New Mexico. All of the long-term strategies will provide regional reductions that will reach beyond the state border of New Mexico. Those Class I areas outside of the state that will benefit the most will be those Class I areas located closest to the New Mexico state border, especially those Class I areas in southern Colorado and eastern Arizona. In particular, the SO_2 backstop trading program and BART determination for San Juan Generating Station will reduce emissions that impact Class I areas in other states.